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In the original French version of the *Asterix* comics, the people of the small village of indomitable Gauls still holding out against the Roman invaders are woken daily by a rooster crowing *cocorico* [kɔ.kɔ.ri.'ko], which in the Dutch translation becomes *kukeleku* [ky.kə.lə.'ky], in English *cock-a-doodle-doo* [kɒ.kə.'du:dl.'du:] and in German *kikeriki* [ki:.kə.ri.'ki:]. Why the differences? Speakers of these languages will swear that the way they hear it in their language is the way a crowing rooster really sounds and, moreover, will judge the other renditions to be wide of the mark. Do they perceive the same sound differently? Similarly, the way in which English words, for instance, are adapted differs widely from one language to another. When words with foreign sounds are borrowed, do the adjustments that one can witness in the speakers' productions take place in perception? Or are the sounds faithfully perceived, with the adjustments being the result of the grammar of the borrowing language? Or do both perception and production play a role in loan phonology? Furthermore, how are borrowed words represented in memory? Do only linguistic factors play a role? *Loan phonology* is a fine collection of papers, all rich in empirical coverage, that address these issues from a number of different theoretical perspectives.

The question whether adaptations take place in production or perception has led to two different scenarios, termed the 'nativisation-through-production' *vs.* the 'nativisation-through-perception' scenarios. Most contributions in this volume, however, consider both production and perception to be important in loanword phonology. Hyunsoon Kim, in 'Korean adaptation of English affricates and fricatives in a feature-driven model of loanword adaptation', proposes that the perception of the acoustic properties of the English loans by Korean speakers is driven by their native grammar, and is not based on phonetic or perceptual similarity. It is proposed that the acoustic landmarks and cues are extracted in perception and directly mapped onto distinctive features in conformity with the native Korean grammar. Structural restrictions play a role in adaptation as well: English word-final coronal [t] is adapted as either [tʰɪ] or, without vowel insertion, as [s], as in *robot*, adapted as [lo.po.tʰɪ] or [lo.pos]. Adaptation as [s] is explained by a structural restriction that the lexical representations of Korean words are likely to end with /s/ rather than with the other coronal plosives, /t tʰ t'/. Kim observes that there are no Korean words ending in [t'] and only a few ending in [t] or [tʰ], and argues that the structural restriction is caused by native word frequency. The feature-driven adaptation of the laryngeal contrast in English plosives (as aspirated *vs.* lenis voiceless plosives) is generalised in the adaptation of the voicing contrast in English affricates and fricatives, where there are no cues to Korean distinctive features, a fact which is taken to support the claim that adaptation is not based on

perceptual or acoustic similarity. Although not written in an OT framework, Kim's contribution, in spirit, comes very close to the Jacobs & Gussenhoven (2000) initial OT approach to loan phonology.

Carole Paradis & Antoine Tremblay, in 'Nondistinctive features in loanword adaptation: the unimportance of English aspiration in Mandarin Chinese phoneme categorization', argue that English stop aspiration does not influence phonemic categorisation in Mandarin Chinese, even though Mandarin Chinese has a phonemic opposition based on aspirated *vs.* non-aspirated voiceless stops. The consistent replacement of English voiceless stops (both aspirated and non-aspirated) as aspirated stops and of voiced stops as non-aspirated stops disfavours, in their view, the nativisation-through-perception scenario. It is worth noticing that in Kim's paper it is shown that French voiceless stops are adapted in Korean as either tense or aspirated stops, and voiced stops as voiceless lenis plosives, which seems to back up their claim.

The nativisation-through-perception scenario is defended most explicitly by Feng-fan Hsieh, Michael Kenstowicz & Xiaomin Mou in 'Mandarin adaptations of coda nasals in English loanwords'. Mandarin Chinese codas are limited to /n/ and /ŋ/ and the low vowel /a/ is allophonically realised as relatively front [a] before the coronal and as relatively back [ɑ] before the dorsal nasal. The authors show that in cases of conflict, that is English [ɑn] and [æŋ], the adaptation of the English coda nasal in Mandarin Chinese, as [n] or as [ŋ], is dependent on the second formant (F2) dimension of the vowel in English, rather than on the exact place of articulation of the coda nasal in English, a fact which is taken to motivate the claim that it is the information found in the phonetically more salient vowel (although an allophonic property of the recipient language) that determines the outcome of the adaptation. The analysis they propose is couched within an OT framework, where Mandarin has a loanword-specific grammar.

Lori Repetti, in 'Gemination in English loans in American varieties of Italian', argues that both perception and production play a determining role in adaptation. She addresses the question of why geminate consonants occur in English loanwords in Northern American varieties of Italian. She proposes an OT account, and argues not only that both perception and production, but also lexical and morphophonological aspects of grammar, play a role in the determination of consonantal length in the loans.

The question of whether non-linguistic factors play a role in loan phonology is addressed most notably in two papers, 'The adaptation of Romanian loanwords from Turkish and French' by Michael L. Friesner and 'Early bilingualism as a source of morphonological rules for the adaptation of loanwords: Spanish loanwords in Basque' by Miren Lourdes Oñederra. Friesner shows that besides linguistic factors, social factors should be considered as well. The different treatment of Turkish and French loanwords with regard to gender is explained by the fact that French borrowings were introduced into Romanian by scholars and because of a conscious effort to 're-Latinise' the language. Oñederra shows that early bilingualism causes the loss of Basque processes, but that continued collective bilingualism and the need to translate Spanish loanwords into Basque motivate the transformation of unproductive phonological substitutions into morphological devices for the adaptation of loanwords.

The issue of how loans are represented in memory, that is, what the underlying representation of loanwords looks like, is addressed in 'The role of underlying

representations in L2 Brazilian English' by Andrew Nevins & David Braun and in 'Nasal harmony and the representation of nasality in Maxacalí: evidence from Portuguese loans' by W. Leo Wetzels. The latter paper shows convincingly that nasal consonants in Maxacalí are derived from nasal vowels that spread their nasality to adjacent consonants and have a specific target. Brazilian Portuguese loanwords in Maxacalí that contain nasal onsets are analysed as underlying representations in which nasality is a property of the vowel. In a similar vein, Nevins & Braun explain the replacement of English word-initial /h/ by [r], as in [rom] for *home* [hom], or the coronal affrication before /u/ in English loans in Brazilian Portuguese, as in the realisation of *U2* as [ju.tʃu], as evidence for a model where speakers attempt to match the surface forms of the donor language, but at the same time use the underlying representations of their native language. Brazilian Portuguese speakers thus set up underlying /r/ and /j̥u/ for English /h/ and /u/. Notice that, although neither of these contributions is written in an OT framework, the OT principle of Lexicon Optimisation would have no problem with Wetzels' proposal, but would face problems with the assumption of underlying /r/ in Brazilian Portuguese, given that in the language only [ʁ ɾ x] surface as its variants.

The first two papers, 'Loanword adaptation as first-language phonological perception' by Paul Boersma & Silke Hamann and 'Perception, production and acoustic inputs in loanword phonology' by Andrea Calabrese, take up more than one-third of the book, but both provide thought-provoking, full-fledged models of perception, production and recognition, the first within an OT framework and the second trying to avoid any particular formal theory of phonology. Boersma & Hamann consider perception to be fully phonological, and propose a model in which markedness constraints interact with cue constraints in perception, but with faithfulness constraints in recognition. To be more precise, in comprehension, the interaction of cue constraints and markedness constraints will relate a phonetic form (indicated with []) to a surface form (indicated with / /), which by the further interaction of markedness and faithfulness constraints leads to an underlying form (indicated with | |). In production, the same interaction relates the underlying form to a surface form, which by the cue and markedness constraints receives phonetic implementation and surfaces as a phonetic form. Adjustments can take place in perception, when going from phonetic to surface form, for instance *shot* [ʃɒt], analysed by Korean speakers as surface /sɟat/, but also when going from surface to underlying form, Korean surface /sɟat/ being recognised as underlying |sɟas|. In this way, the authors claim that loanword-specific phonology can be done away with. Calabrese proposes that the raw acoustic signal with which speakers are confronted is stored in a short-term acoustic working memory buffer, after which – to simplify considerably – it is first acoustically analysed into a composition of discrete acoustic landmarks and cues, and then checked by the long-term echoic memory storage system. If there is no match, it is further analysed by phonological, morphological, syntactic and semantic top-down components. This predicts that perception will show evidence of both components. Bottom-up processes analyse the incoming acoustic signal, and top-down processes compare the fragmentary results of the continuous bottom-up processing against lexical entries and make use of stored knowledge of likely inputs. In this way, for instance, missing phonemes can be restored, or departures from perceptual experience can be generated, as in mishearing.

Use of lexical knowledge or stored knowledge of likely inputs seems intuitively to be the most plausible explanation for the storage of perceived /sjat/ as underlying [sjas] in Korean. Speakers are apparently aware of the structural restriction that Korean words in the underlying representation are likely to end with [s] rather than with the other coronal plosives, [t^h t'], and that there is only a handful of words of the latter type. This knowledge is hard to model in an OT framework. Boersma & Hamann use a positional faithfulness constraint IDENT(stri(.)), which requires that, in coda position, the underlying and surface values of stridency should be identical. This constraint is split up into two faithfulness and two anti-faithfulness constraints, where the latter two require that underlying [+strident] should not correspond to surface /+strident/, nor underlying [-strident] to surface /-strident/. The constraints become active if a surface form is recognised without meaning attached to it, necessarily so, because surface /pat/ 'field' is stored in the lexicon as [pat^h]. Lexical constraints of the type *<field>[pas] ('the morpheme <field> does not link to underlying [pas]') are used. With the latter constraint dominating the anti-faithfulness constraint *| -stri|/-stri(.)/, the faithfulness constraint *|+stri|/-stri(.)/ and the lexical constraint *<field>[pat^h], perceived surface /pat/ is correctly stored in the lexicon as [pat^h]. Given that Boersma & Hamann argue that loanwords are not yet in the lexicon, lexical constraints do not play a role there. This implies that surface /sjat/ enters the lexicon or is recognised without meaning attached to it (cf. their tableau (29) for a full explanation). It also implies, apparently counterintuitively, that loanwords are stored, at least initially, without meaning.

What strikes one when reading the volume is how good speakers actually are at perceiving foreign sounds. Mandarin Chinese speakers are aware of the English [a]–[æ] difference, which is allophonic in their language. Korean speakers apparently perceive the voiced and voiceless French stops as well as they perceive the difference between the English voiceless aspirated and voiced non-aspirated ones, even in the absence of reliable cues. Although not as good, the German respondents in Żygis & Hamann (2003) were almost as successful as the Polish ones in keeping apart the Polish postalveolar fricatives, none of which occurs in their native language. Similarly, Kijak (2009) observes in her experiments on stress perception that the Czech respondents (who should be stress-deaf, given that Czech stress is entirely predictable (fixed on the initial syllable) and therefore not encoded in mental representations) nevertheless perform very well and the English respondents (stress being partially predictable) very poorly. She argues that surface regularity or surface irregularity only partially accounts for the results, and that other factors, such as the use that is made of stress in word recognition (Czech L1 stress fulfils an important demarcative function, whereas English L1 stress does not), is also reflected in the stress-perception ability. This might be the reason why the Mandarin Chinese speakers are sensitive to the allophonic front–back distinction in English low vowels, given that Hsieh *et al.* note that the place features of nasal codas 'are relatively faint and highly susceptible to neutralization cross-linguistically' (p. 133). For Boersma & Hamann, the Korean perception of *spike* as /sɪ.pʰa.i.kʰi/ – where the labial plosive is perceived as /pʰ/ and not, being non-aspirated, as /p'/ or /p/ – is problematic, given the ranking of the cue and markedness constraints. They propose that adaptation in this case is due to bilinguals who either shift their perceptual boundaries depending on the language or set up underlying representations in terms of the donor's language

inventory. This view does not seem to be readily compatible with the above-mentioned consistent replacement of the voiced and voiceless French stops. The above remarks do not mean that there is no misperception. On the contrary, misperception does occur even when speakers listen to their own language. Native speakers' intuitions are mostly based on the output of the lexical phonology, not on the output of the post-lexical phonology. Speakers of Dutch, for instance, will judge that the final consonants of the verbs in *Ik tob* 'I worry (about)' and *Ik top* 'I top' do sound the same, but will swear that the final sound of the verb *koop* also sounds the same in *Ik koop dille* 'I buy dill' and in *Ik koop tijm* 'I buy thyme'. In fact, due to post-lexical regressive voicing, they are realised as [b] and [p] respectively. Speakers not only perceive foreign sounds extremely well, but, at the same time, apparently hear what they think they hear in their own language, and can be misled by their lexical representations, which might well be the reason that the crowing rooster is believed to sound different in different languages.

In sum, if, as the editors note in their introduction, the way in which unfamiliar sounds and sound sequences are adapted in the recipient language offers a direct window for observing how acoustic cues are categorised in terms of the distinctive features relevant to that recipient language and for studying its phonological processes in action, then this collection of essays really qualifies as a room with a splendid view. It is most certainly a must-have for every phonologist. *Loan phonology* is an excellent collection of essays offering, from various theoretical perspectives, a broad view of all the complexities involved in the nativisation of loanwords. It can be recommended to theoretical phonologists and to every phonologist interested in perception and production, and will be of great interest to linguists interested in language contact and bilingualism or multilingualism.

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